

Response to Model Integration and IDEF Question
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The DoD Enterprise Data Model is being developed and maintained in a tool which supports IDEF1X and another graphical notation system. The question of whether or not the model should be maintained in a tool which is dedicated exclusively to an IDEF representation seems to be an issue that a number of people are asking. A context for this question is necessary.

When the IDEF Activity Based Cost Study for the ITPB was conducted and presented in 1991, one of the attached reports, "Application of Methodologies and CASE Tools in Business Modernization," stated:

IDEF . . . is not well suited to software and database development, lacking many of the aspects needed to ensure effective and complete transformation from the conceptual to the physical -- it is in no way a "lower CASE" product.

The transition from conceptual to physical must be supported by DoD Enterprise Model architecture or the functional process improvement program described in DoD 8020.1-M (Draft) would be frustrated. The functional process improvement program includes the following basic steps listed in the Overview of the original DoD 8020.1-M (Draft), August 1992:

1. Establish the Functional Architecture (Chapter 4)
2. Develop the Strategic Plan (Chapter 5)
3. Establish the Process and Data Baselines (Chapter 6)
4. Establish the Information Systems Baseline (Chapter 7)
5. Perform Activity Modeling (Chapter 8)
6. Perform Data Modeling (Chapter 9)
7. Evaluate and Select Process, Data, and Information System Improvement Alternatives (Chapter 10)
8. Prepare the Functional Economic Analysis (Chapter 11)
9. Execute the Approved Process, Data and System Changes (Chapter 14)
10. Develop Information Systems to Support Process Improvement (Chapter 15)
11. Revise Baseline and Seek Further Improvement Opportunities (Chapter 16)
12. Conduct Defense IM Program Reviews (Chapter 17)

IDEF was never represented to directly support all of these activities. In fact, in the August draft release, it states:

IDEF models provide a natural bridge between functional process improvement and the information engineering techniques and tools used for development of supporting information systems. (p. 59)

The manual goes on to say in Chapter 9: Perform Data Modeling:

(1) In conducting process improvement, data modeling should be accomplished to the same level of depth and detail as the activity modeling which it supports. Normally, a key-based model at the same level of detail as its activity model counter-part is appropriate to support process improvement analysis. (A key-based model shows data entities and their relationships, plus the attributes that uniquely identify each entity.)

Once the analysis begins to go beyond process improvement to include activities such as data standardization, detailed functional data architecture, definition, shared database analysis and transition design, other "non-IDEF" modeling methodologies may be used:

(2) Data modeling as a source for the creation of standard data definitions must be accomplished to the level of a fully attributed, normalized logical data model. (A fully attributed, normalized logical model extends a key-based model by adding non-key attributes, and then grouping the attributes to eliminate data redundancy.) . . . (p. 70-71)

(b) Other, non-IDEF modeling methodologies may be applied in the generation of fully attributed and normalized logical data models. However, the final representation of the data model for incorporation in the functional architecture . . . must be in IDEF format. The DoD data model that is part of the DoD Enterprise Model will also be maintained in IDEF format. (p. 71)

By this point in the process, the work has become fairly technical requiring the assistance of functional specialists, but moving beyond the planned scope of IDEF.

(3) The [detailed, normalized] logical models created to support data administration must be converted to physical data models for definition of actual data base structures. Information system development requires this further level of detailed technical modeling, and is addressed through the migration system data management plan [now incorporated in the Strategic Plan] . . . (p. 71)

The Data Administration Program Management Office must satisfy all of these requirements and do it as efficiently and effectively as it can. In order to do that, DAPMO chose a CASE tool that not only would satisfy the requirement of maintaining the DoD Enterprise Data Model in IDEF notation but also position the model to support and satisfy all of the other requirements mentioned above as well. The tool will support:

1. Recording the results of business process improvement data models to the key-based level (with some significant and rigorous integration between process and data models).
2. Converting key-based data models to fully attributed, normalized data models.
3. Converting the final logical data models to physical designs of the actual database structures.

The final item to consider is whether or not requiring all data modeling to be done in IDEF would contribute significantly to data model integration. Model integration is a fairly technical activity requiring functional expertise to resolve issues of domain, semantic and rule consistency. The technical experience required to support this activity is not notation-based; it is more concept-based. Model integration works best when it considers a cluster or subset of the data model representing a common concept in a functional domain. Model integration relies on extensive modeling experience and exposure to multiple modeling methodologies to evaluate and analyze the subsets and to integrate the resulting concepts to extend the DoD Enterprise Data Model. Having all models in IDEF1X format before this analysis takes place would place a greater burden on the submitter than is necessary. If the tools the modelers use are capable of representing their model in IDEF1X, submitting model subsets for integration in that format would be welcome but not required.

Some people have claimed that having all models in IDEF1X would facilitate model integration from a tool perspective. Automated model integration among heterogeneous tools requires:

1. First an import and export capability for each tool involved.
2. Second, an ability to map semantics of the imported tool into some semantic equivalence with the target tool which will be used to support model integration.
3. Finally, a model integration support facility in the target tool to perform model integration activities.

In reference to item 1, most IDEF1X tools (especially stand-alone PC tools) do not have import and export capabilities. Concerning item 2, standards to facilitate exchange of data about models from various tools to support the "semantic equivalence" requirement are being developed but are not complete. This means that no matter how good a model integration tool you have, model integration is going to require significant manual effort. Even if both item 1 and 2 were rectified, a model integration tool is still not going to be able to determine that a synonym or homonym relationship exists between components of two data models or among multiple data models being integrated and human intervention is going to be required no matter what. Even requiring every data

model developer to use the same tool, although it might overcome item 1 and 2, would not solve this problem.

In summary, the development and maintenance of the DoD Enterprise Data Model must satisfy the requirement to maintain it in a common definition language (IDEF1X) format to effectively communicate with the functional or business process improvement efforts. At the same time the Department must maintain the model in a form that supports a number of other essential purposes, including those mentioned in DoD 8020.1-M (Draft). Requiring that the DoD Enterprise Data Model should be maintained in a tool dedicated exclusively to IDEF would not recognize the other requirements. The tool selected satisfies the broad range of requirements and supports the model integration procedures as well as we can until the ICASE solution is developed.